THE GOVERNOR'S REPORT

DROUGHT IN MONTANA

May 2004

The Honorable Governor Judy Martz

Prepared by

Montana Drought Advisory Committee

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Introduction

Montanans now find themselves facing year six of an ongoing drought that began in earnest in the summer of 1999, although a number of regions of the state can trace the origins of this drought to periods of below average precipitation dating from summer of 1997.

The state's biggest drought story remains the deepening socio-economic drought. The drought threatens to change the very fabric of Montana's rural communities and landscape. It is the final straw that can bankrupt 4th- and 5th-generation farmers and ranchers, placing the birthright of descendants of pioneer families on the auction block. Open space treasures are eventually taken out of production to be subdivided or consumed by corporate concerns, never to be farmed or ranched by a family again. This is the story of the human toll of drought.

And like the changing vistas, many of the well-established county agri-businesses are disappearing forever, along with other main street institutions. A combination of market forces, aging in agriculture, regional mass marketing, and trade policy are often blamed for the bad times. But to the farmer and rancher, who would just be satisfied to raise a crop or herd of stock, take it to market, and provide for his or her family - the drought comes to mind first and seems to be the bottom line. Now the largest cities of the state are feeling the pain as well.

The Natural Disaster Designation (NDD) status received for Montana last year for 35 counties for 2003 remains in place through the end of July 2004, for claims on losses in 2003. And Governor Martz recently received notification from Secretary of Agriculture Veneman that eleven additional counties and three tribal nations were upgraded from contiguous status to primary status for the 2003 NDD, making them eligible for additional benefits reserved for primary counties. The USDA state office of FSA has also approved some Montana counties for ECP and CRP Haying and Grazing for 2004 in recent weeks. The State USDA Committee now approves county USDA committees requests for eligibility to the foregoing programs without approval from Washington, D.C.

Unseasonably warm temperatures in March began to melt our precious mountain snowpack early, and the trend continues as the mercury regularly climbs into the high 70s. Runoff from the snowpack remains conspicuously meager as water users scramble to capture what they can for dry pasture and hayfields. And irrigators with old water rights and contract water from storage projects are now being told not to expect much or anything at all, after June 10.

The Montana Governor's Drought Advisory Committee began hearing comment from constituents comparing the current drought with the Great Drought of the 1930s as early as spring of 2002. Increasingly, many agree that this comparison seems eerily accurate. In fact, some climatologists and dendro-chronologists (those who study historical annual tree growth ring record) are taking a closer look at the mega-droughts, which have occurred in what is now the American West, dating back to the 16th Century and before. Perhaps we have been in a relatively wet period since the first sod was turned with the opening of the West. And now we are in the midst of long-term change.

The Committee finds itself in uncharted territory since its inception in 1991, when it was created by an act of the Montana Legislature. The wisdom of leading almost all western states in taking this official action has proven visionary, since the state has experienced widespread drought in eight of the past twelve years, including 1992, 1994, 1996, 1999, 2000, 2001, 2002, 2003, and now, 2004. Over that time, the Committee has improved the way it meets its statutory mandate through improvements in technology and communication ushered in with the advent of the Internet, expansion of real-time data collection networks, innovation of more sophisticated drought mitigation strategies, better assistance to local drought planning efforts, contributing to improvement in national drought policy, and networking with the scientific community to gain a better understanding of drought and climate.

Nearly 50 watershed groups across the state now help river basin residents endure the drought by pulling together once disparate and adversarial stakeholder groups to join forces. Continued drought has been burdensome and challenging, but the coordinated and unified response of the groups, with government and the private sector playing supporting roles by providing hydrologists, biologists, engineers, and planners, has improved steadily over recent years, as plans that require sharing the water shortage are refined to integrate the lessons of experience.

And the state's county drought committees, led by commissioners and other local officials in dryland farming and range areas, have been instrumental in helping secure needed federal assistance and changing national drought and farm policy. Recently, extension agents, county commissioners, conservation district members and producers pioneered a grass-roots county soil moisture monitoring network initiative that has garnered national attention for its resourcefulness and determination. The fruits of this effort are being realized as of this writing.

As we face the year ahead, the Committee is ever mindful that just when we think we have seen the worst of drought, it can get worse yet. In June of 2002, a three-day rainfall event in the northcentral region of the state seemed to many to be the "Perfect Storm." But much to the dismay of the hopeful, the benefits of the storm disappeared within several hot and windy weeks, as conditions regressed to the dust bowl scenes of just 60 days earlier. Cool temperatures and spotty rains eventually eased some of the pain. We are learning of the cumulative effects of drought, first hand.

We now know that cumulative years of drought have a multiplier effect, not simply an arithmetic one. Livestock producers have not truly restocked since wholesale liquidation in 2001 & 2002, when over 350,000 head were sold and/or moved out of state. Improvement in moisture conditions leading into spring of 2003 made many hopeful that recovery from drought was finally underway. And indeed, grain producers of the state that planted winter wheat in fall of 2002 were rewarded with yields of 50 to 60 bushels per acre. But a reversal in conditions brought a cessation in precipitation, badly needed to sustain recovery. The dry spell was further exacerbated by a withering spell of record high temperatures. So we have learned that as the drought deepens, the potential to lose precious momentum and fall back, increases. And we know that we must continue to prepare and plan for the worst, and hope for the best.

Executive Summary

The Montana Governor's Drought Advisory Committee met April 23, 2004 to assess moisture and water supply conditions pursuant to MCA 2-15-3308. The committee had decided at its February 20 meeting that the drought status, by county, would remain in place statewide until the April meeting, when the drought status of each county would again be assessed. The committee concluded that presently, water supply and moisture conditions indicate that the state remains in an ongoing severe drought that started in summer of 1999. (See map figure – U.S. Drought Monitor)

The Drought Advisory Committee introduced a new system of classification of the degree of drought in early 2004 that includes six categories ranging from least to most severe: No Drought – Moist; No Drought; Slightly Dry; Moderately Dry; Severely Dry; and Extremely Dry. At this time 29 counties are classified as within the Severely Dry category, 12 counties are in the Moderately Dry category, 10 are in the Slightly Dry category, and four counties are in the No Drought category. One county, Beaverhead County, is in the Extremely Dry category and there are no counties in the No Drought – Moist category at this time (See Drought Status map figure).

Counties classified as within the No Drought category at this time include four counties in the northeast corner of the state, Richland, Roosevelt, Daniels, and Sheridan. Counties in the Slightly Dry category include seven counties east of the Continental Divide, four of which are located in the Northeast climate division, two in the north section of the Southeast climate division, and one at the eastern edge of the Northcentral climate division. West of the divide, Slightly Dry counties include Ravalli, Granite, and Deer Lodge counties, all located at the southern edge of the Western climate division. The Committee will meet next on May 20, in Helena to review and update drought status.

At this time, Montana remains firmly within an ongoing drought. Generally speaking, most experts are in agreement that at least two years of normal precipitation and temperatures statewide would be necessary before sufficient relief could be realized to be able to state that Montana has recovered from drought. The cumulative effects of five years of drought persist in low reservoir levels, reduced groundwater levels, and poor sub-soil moisture, nearly statewide. Although there is a chance that average to above average rainfall and temperatures could bring short-term relief through the month of June, particularly in the meteorological and agricultural drought, the long-term effects of drought, as present in the hydrological and socio-economic aspects of drought, will most likely be felt for several years to come.

In conclusion, the potential for continued drought in 2004 for Montana is ***Very High***, with significant impacts expected to continue for groundwater and surface water uses, including irrigated farming of crops and hay, municipal water supplies, wildfire on range and forest lands, and for instream resources, such as fisheries and other aquatic life. Montanans residing in river basins having below average valley or mountain precipitation for the water year to date, low subsoil moisture, and water storage projects with below average contents, will experience an increase in drought impacts by early summer. The potential for the ongoing drought to impact dry land farming remains ***High***. It is important to remember that low streamflow, wildfire, and other impacts from dry, and warm weather, are common by late summer in Montana in any given year.

Mountain Snowpack

The Natural Resource Conservation Service (NRCS) reported that, as of April 5, 2004 the snow water equivalent (SWE) of mountain snowpack ranged from well below average to average, or about 65 to 80 percent of average, throughout the state. By April 5, the snow water content of mountain snowpack, west of the Continental Divide, averaged 80 percent of the 30-year average for the period 1971 through 2000. The maximum snow water content of the season for the Missouri Headwaters and Upper Yellowstone River basin snowpacks occurred about March 22 however, at about 90 and 80 percent of average, respectively.

Unusually warm weather in March, when there were 19 consecutive days with daily high temperatures well above the average high temperatures for each date, caused a loss of about 20 percent of the snow water content in place at the mountain NRCS Snow water gauge network. Unseasonably warm spells continued into April, leaving the mountain snowpack about 20 percent behind the average for the same dates. Unseasonably cool temperatures and continued mountain precipitation would be needed over the next month to bring snow water content remaining in mountain snowpack in line with the average water contents for this period. The soil moisture deficit has been consuming most of the runoff from the melting mountain and valley elevation snowpack resulting in little, if any, change in local streamflow.

Precipitation

According to the National Weather Service, precipitation received for locations across the state currently stand at well below average to average, for the Water Year (Oct. 1, 2003 through April 10, 2004). As of April 1, the Northwest, Southwest, Southcentral, and Southeast divisions, are below average, all close to 80 percent, the Northcentral and Central divisions are close to average, and the Northeast climate division is above average at 131 percent for the water year. Precipitation figures from the National Weather Service for the period of April 1 through April 10 indicate that much of the state is well below average with a few exceptions.

According to the NRCS April 1, 2004 Water Supply Outlook Report, mountain and valley precipitation for the period of October 1, 2003 through March 31, 2004 was 87 percent of average and 95 percent of last year for Montana, both east and west of the Continental Divide. For the month of March, mountains and valleys statewide received 55 percent of average precipitation, with locations east of the divide averaging 50 percent, and areas west of the Divide receiving 63 percent of average moisture. Water year precipitation was 85 percent of average west of the Continental Divide, and 88 percent of average east of the Divide.

Given that Montana is entering its fifth, or more, consecutive year of an ongoing drought, it is appropriate to consider deficits in precipitation over the full duration of the drought. Maps provided by the National Weather Service on its Internet site show multi-county areas of Southwest and Northwest Montana with departures from average on the order of 15, to as much as 25 inches of moisture. See Map Figure: Montana Precipitation Five-Year Departure from Normal.

Soil Moisture

According to the Climate Prediction Center, soil moisture, as expressed by the April 17, 2004 Palmer Drought Severity Index (PDSI) is currently rated as Incipient Drought in the Northeast climate division, Severe Drought in the Northcentral, Western, and Southeast divisions, and Extreme Drought in the Southwest, Southcentral, and Central climate divisions.

Unseasonably warm temperatures and below average precipitation over the past eight weeks have stalled improvement of soil moisture figures, except where winter's valley elevation snow melted, replenishing moisture in the topsoil layer. Subsoil moisture remains significantly depleted in most areas of the state. Current PDSI figures indicate that from three to nearly seven inches of moisture would be necessary in coming weeks to bring divisions currently ranked in the Severe and Extreme drought categories to within the normal soil moisture range.

Reservoir Storage

As of April 1, 2004, the U.S. Bureau of Reclamation reported that water storage was above normal at two, normal at three, and below normal at one of six major hydroelectric reservoirs in Montana. Storage for March was above normal for Lake Koocanusa and Hungry Horse Reservoir, and normal for Canyon Ferry Lake, Bighorn Lake, and Flathead Lake. Storage for Fort Peck Lake was below normal. Water storage remained below normal at the four major irrigation reservoirs: Lima, Clark Canyon, Gibson, and Fresno.

Four state-owned water storage projects had contents below 60 percent of average as of April 1, compared with two projects below 60 percent one year ago. Ten of 18 state water storage projects currently have contents ranging from 78 to 130 percent of average, and four projects range between 41 and 59 percent of average as of April 1. Inflow to storage projects remains weak due to recent cool weather and low soil moisture. Inflow will increase as soon as warm temperatures return to cause runoff of mountain snowpack. By the end of May, following the runoff of mountain snowpack and well into the spring precipitation season, reservoir managers will have a more precise forecast of water supply for 2004.

Streamflow

April monthly mean streamflow was below normal at three, above normal at two, and normal at three of eight long-term U.S. Geological Survey gauging stations. The monthly mean streamflow was below normal on Marias River near Shelby; Rock Creek below Horse Creek near International Boundary; and Yellowstone River at Billings. The monthly mean streamflow was normal on the Blackfoot River near Bonner, theYaak River near Troy, and the Clark Fork at St. Regis. The monthly mean streamflow was above normal on the Yellowstone River at Corwin Springs and the Middle Fork of the Flathead River near West Glacier.

Ground Water

The state's aquifers have dropped considerably over the course of five years of drought, with a number of small towns losing their municipal supplies from 2002 to 2003. Although some of the long-term monitoring wells across the state used by experts to determine climate variability have shown indications that aquifers have experienced some recovery, the cumulative effects of the ongoing drought indicate that the hydrological drought remains significant. Ground Water typically reaches its annual peak about mid-summer each year. The Drought Committee includes a representative from the Montana Ground Water Information System, located at Montana Tech, which monitors hundreds of wells statewide for a variety of data.

Conclusion

Montana is entering its sixth consecutive year of widespread drought. The probability that average rainfall between now and mid-July could address precipitation deficits that have accumulated over that period of time is remote. The hydrologic, or long-term aspects of the ongoing drought are found in low reservoir storage, depleted aquifers, low streamflow, dryness of large forest fuels, and continued low subsoil moisture. It takes years for recovery to address hydrologic drought on the scale evident across the state at this time. The same holds true for the socio-economic drought. Local economies will, in some ways, never fully recover from the changes wrought on small agricultural towns as a result of this drought. This is not to say that we have no chance of seeing recovery in the meterological and agricultural drought. A steady succession of precipitation events, accompanied by cool temperatures, over the course of the next eight weeks would mitigate effects of drought in the short-term.

At this time, the probability of continued drought impacts through July is ***Very High*****.** Water users in river basins with below average mountain snowpack, valley precipitation, and reservoir storage will experience impacts from drought by late spring. Areas that fall into the foregoing risk category include the Southwest, Southcentral, Central, and Southeast climate divisions. The Western, Northcentral, and Northeast climate divisions remain highly vulnerable to ongoing drought impacts without average to above average precipitation through July. The probability of continued drought impacts through July for the Western, Northcentral, and Northeast climate divisions is ***High.***

Dryland farming and livestock grazing regions must see steady improvement in subsoil moisture to avert seasonal drought impacts. Water users in river basins without access to ample stored water will likely face shortages by June without continued average to above average precipitation through spring and summer. Groundwater uses, surface water supplies, the agricultural economy, and numerous selected fisheries, continue to be areas of concern. Timely and above average precipitation through the spring and summer months will be necessary to begin to replenish sources of groundwater and subsoil moisture, to ensure normal dry-land farming production, to maintain minimum streamflow, and to suppress wildfire danger.

In the near-term, it is recommended that the Drought Advisory Committee, working together with the state and federal government and the state's Congressional Delegation, pursue all forms of relief assistance for drought-affected Montanans.

INTRODUCTION

The Montana Drought Response Plan defines drought as:

Drought is an extended period of below normal precipitation that causes damage to crops and other ground cover; diminishes natural streamflow; depletes soil and subsoil moisture; and because of these effects, causes social, environmental, and economic impacts to Montana.

In 1991, Montana's Fifty-second Legislature passed House Bill 537, creating a state drought advisory committee and defining its responsibilities. The law states:

The Drought Advisory Committee shall submit a report to the governor describing the potential for drought in the coming year. If the potential for drought merits additional activity by the drought advisory committee, the report must also describe:

(a) Activities to be taken by the drought advisory committee for informing the public about the potential for drought;

(b) A schedule for completing activities;

(c) Geographic areas for which the creation of local drought advisory committees will be suggested to local governments and citizens; and

(d) Requests for the use of any available state resources that may be necessary to prevent or minimize drought impacts (Section 2-15-3308 MCA 1991).

The Report

This report is divided into two sections. The first section, Current Water Supply and Moisture Conditions, includes current data on the state's water storage supply, soil moisture, mountain snowpack, streamflow, weather and climate forecasts, precipitation, and wildfire potential. The second section, Responses to Water Supply and Moisture Conditions, provides an assessment of the probability of drought in coming months given current conditions, and the Drought Advisory Committee's response(s) to that assessment.

The Department of Natural Resources and Conservation (DNRC) prepares the Water Supply and Moisture Condition Report monthly, from February through October of each year. This report summarizes current and projected water supplies and soil moisture conditions collected by a variety of federal and state agencies. It is used by the Governor's Drought Advisory Committee to monitor water supply and moisture conditions**. The Governor's Report serves as an assessment of drought conditions and a summary of appropriate responses to address the types of impacts from drought anticipated in coming months.**

CURRENT WATER SUPPLY AND MOISTURE CONDITIONS

Mountain Snowpack

Most of the annual streamflow in Montana originates as snowfall that accumulates high in the mountains during fall, winter, and spring. Aquifers, lakes, streams, and reservoirs are largely dependent on runoff from mountain snowpack. As the snowpack accumulates, hydrologists forecast the runoff that will occur when it melts and in turn, streamflow for the summer months. Montana's mountain snowpack generally accounts for 80 percent of streamflow in spring and early summer in Montana's higher elevation river valleys.

March mountain precipitation ranged from severely below to below average, on the heels of a weak month of February for mountain precipitation. As of April 1, 2004, NRCS Montana Water Supply Outlook Report indicates that mountain snow water content statewide were 78 percent of the 1971-2000 average and 84 percent of last year. West of the Divide snowpack was 80 percent of average and 87 percent of last year. East of the Divide snowpack was 75 percent of average and 77 percent of last year. Record high snowmelt rates during March melted as much as 20 percent of the high-elevation snow. Much of that water was intercepted by dry soils lying between the snowfields and streams, resulting in little runoff to streamflow.

West of the Continental Divide, the Columbia River Basin mountain snowpack was 89 percent of average. East of the Continental Divide, the snowpack of the Missouri River basin was 91 percent of average and 101 percent of last year, and the Yellowstone River basin was 87 percent of average, and 111 percent of last year at this time.

After an average start to the mountain snowpack accumulation season last fall and early winter, gains to snow water content during March and April 2004 were hampered by unseasonably warm high-elevation temperatures, preventing the snow water content to keep up with the average rate of accumulation. NRCS Snow Survey has determined that, for most of the state, the peak of mountain snow water content this year occurred about the third week of March rather than the 30-year average of about April 15. (See Table 1. Remaining Montana Snowpack and Year-to-Date Precipitation).

The mountain snow water content of the upper Missouri and Yellowstone river basins continued to deteriorate through April, where they ended the month at 70 and 60 percent of average, respectively. Snow water content along the Rocky Mountain Front Range never achieved average levels, with the Sun-Teton-Marias reaching 82 percent of average, but falling below 60 percent by month's end. Farther north, the St. Mary and Milk river drainages ended the season at slightly above 70 percent for snow water content. The Smith-Judith-Musselshell basin reached 105 percent of average in March but had fallen to only 62 percent at the end of April.

West of the Continental Divide, the Lower Clark Fork and Flathead River basins peaked at about 80 percent of average for mountain snow water content. The upper Clark Fork and Bitterroot River basins reached the 85 percent range by the end of March but ended the snow season with snow water content of 75 and 65 percent of average April 30. The Kootenai River basin reached about 90 percent in March, but finished the mountain snow season at about 70 percent of average for snow water.

Precipitation

The National Weather Service reports that for the period October 1, 2003 through March 31, 2004 (Water Year), valley precipitation statewide ranged from slightly below average to average. Water year precipitation for the Western division was 81 percent of average, the Southwest was 82 percent, the Northcentral 108 percent, the Central 90 percent, the Southcentral 76 percent, the Northeast 131 percent, and the Southeast 85 percent of average (See Figure 2. Montana Precipitation for the Water Year)

March 2004 precipitation was well below average through the end of the month. The western climate division was 55 percent of average. The southwest and north central divisions were 50 and 31 percent of average, respectively. The central, and south central divisions were at 46 and 23 percent, and the northeast and southeast divisions received 38 and 47 percent of the long-term average for moisture during the month. The following table summarizes statewide precipitation at valley locations through April 20, 2004. *

According to the NWS Drought/Precipitation Summary for April 30, 2004, Great Falls and Havre are currently ranked at the 2nd driest and 4th driest water years to date in 112 and 124 years, respectively. Lewistown is currently in its 10th driest, and Miles City its 5th driest for the water year to date in 108 and 111 years, respectively, Bozeman ranks 8th driest of a 63 year record, Butte ranks 5th driest in 110 years, and Cut Bank is currently ranked 3rd driest in its 101 years of record for water year precipitation (October 1, 2003 – April 30, 2004). **

Precipitation Statewide for Selected Time Periods
October 1, 2003 - April 20, 2004
Percent of Average
National Weather Service

Division	10/1/03 - 3/31/04	4/1/04 - 4/20/04 *
Western	81	152
Southwest	82	129
Northcentral	108	90
Central	90	126
Southcentral	76	114
Northeast	131	50
Southeast	85	10

* Precipitation figures for period 1/1/04 – 4/20/04 are provisional and from limited number of sites

Precipitation

According to the April 1, 2004 NRCS Montana Water Supply Outlook Report, March mountain and valley precipitation across the state was 55 percent of average and 35 percent of last year. Water year precipitation was 87 percent of average and 95 percent of last year. According to the report, mountain and valley precipitation for the period of October 1, 2003 through March 31, 2004 was 88 percent of average and 98 percent of last year east of the Continental Divide, and 85 percent

of average and 92 percent of last year west of the Divide. March mountain and valley precipitation was 63 percent west of the Divide, and 50 percent of average east of the Divide.

According to the Montana Climate Atlas (Caprio and Nielsen, 1992): *In April, wet snow or rain typically leaves more than an inch of precipitation across the southern tier of the state. Drought years are notably linked with the failure of these early season storms. Mountains along the Continental Divide in the far north and south of the state normally receive more than six inches of precipitation in April.*

According to the April 30, 2004 National Weather Service Montana Drought/Precipitation Summary, storms of April arrived for a few locations, including Helena with 1.82 inches, or 200 percent for that period; Kalispell with 1.61 inches, or 132 percent; Missoula with 1.07 inches, or 98 percent; Butte with 1.17 inches, or 115 percent; Dillon with 1.09 inches or 118 percent; Bozeman with 1.29 inches, or 92 percent; and Havre with 0.77 inches, or 89 percent of average for the period. See ** http://www.wrh.noaa.gov/Greatfalls/drought_semi.pdf

Other locations did not fare as well, with Great Falls receiving 1.06 inches, or 76 percent; Miles City receiving 0.05 inches, or 4 percent of average; Cut Bank with 0.50 inches, or 56 percent; and Lewistown with 0.85 inches or 62 percent. Normal April precipitation across the state ranges from about 1 to 1.4 inches. May monthly precipitation averages from 1.75 to 2.25 inches statewide.

Soil Moisture

As of April 19, 2004 Montana Agricultural Statistics Service reports that soil moisture slipped from the week before, with topsoil moisture rated 26% very short, 33% short, 39% adequate, and 2% surplus. Subsoil moisture was rated 35% very short, 36% short, 28% adequate, and 1% surplus. Last year at this time, subsoil was rated 46% very short, 35% short, 19% adequate, and 0% surplus.

Winter wheat crop conditions are down from last year at this time and are rated 13% very poor, 17% poor, 40% fair, 26% good, and 4% excellent. Last year at this time, the winter wheat crop was rated 1% very poor, 7% poor, 23% fair, 56% good, and 13% excellent. Conditions are declining for winter wheat with some winterkill and drying of soils. Planting is ahead of normal with warmer temperatures and good conditions for fieldwork.

Pasture and range feed conditions are fair to poor and are currently rated 20% very poor, 24% poor, 37% fair, 16% good and 3% excellent. The week of April 11, producers were feeding 78% of cattle and 73% of sheep with supplemental feed. Range conditions across Montana have suffered damage from windy and dry conditions over the past four years and will take several years to fully recover.

The Palmer Drought Severity Index

The National Climate Prediction Center provides weekly Palmer Drought Severity Index numbers. The Palmer Drought Severity Index (PDSI) indicates the long-term effects of precipitation shortfalls to soil moisture in rangeland, dryland crop areas, and timberlands. The PDSI values for

April 17, 2004 indicate that moderate to extreme drought conditions are present in six of seven climate divisions of Montana at this time.

The PDSI values for the Southwest, Southcentral, and Central divisions are alarming and rated Extreme Drought at -6.97, -5.29, and –5.18. The Northcentral, Western, and Southeast divisions are rated at -3.05, -3.33, and –3.41, or Severe Drought. The Northeast division is rated - 0.51, or Incipient Drought. It is estimated that from three to seven inches of precipitation would be necessary for a return to normal conditions in all but the Northeast climate division. (See Table 5. Palmer Drought Severity Indices in Montana).

Table 5 compares the Palmer Drought Severity Index values for April 5, 2003 with those of April 17, 2004, by climate division. Subsoil moisture remains very low in most parts of the state as a result of dry conditions dating to summer 1999.

Reservoir Storage

Storage in the major reservoirs across the state was 85 percent of average and 90 percent of levels recorded last year at this time, according to the NRCS April 1, 2004 Water Supply Outlook Report. West of the Continental Divide, reservoir storage was 143 percent of average and 92 percent of May 1, 2002 levels. East of the Divide, reservoir storage was 71 percent of average and 90 percent of storage last year.

The U.S. Bureau of Reclamation reports that, as of April 1, 2004 Fresno and Nelson reservoirs on the Milk River are 56 and 101 percent of average, respectively, in contrast with last year at this time, when they were both at 124 percent of average. Canyon Ferry Reservoir, on the Upper Missouri River has contents of 95 percent of average, with 73 percent snow water remaining in the mountain snowpack of its headwaters. Lake Elwell, on the Marias River is at 105 percent of average. Hungry Horse Reservoir, on the South Fork of the Flathead River had 130 percent of average storage as of April 1. Bighorn Lake on the Bighorn River, a tributary of the Yellowstone River, had storage contents of 84 percent of average, in contrast with 56 percent at this time one year ago.

Gibson Reservoir, located on the Sun River, had contents of 72 percent of average. However, the Sun-Teton-Marias watershed ended the snow season with water year precipitation of 84 percent of average and 69 percent of 2003. Warm weather in March and early April brought snow water out of the Rocky Mountain Front earlier than normal. It is therefore unlikely that Gibson will fill a second time this season, as it usually does. Reclamation cautions that without above average precipitation in coming weeks, Gibson Reservoir water users may see shortages by mid-summer. See (Table 3. U.S. Bureau of Reclamation Reservoirs).

Ten of 18 state water storage projects currently have contents ranging from 78 to 130 percent of average, and four projects range between 41 and 59 percent of average as of April 1. See (Table 4. State-Owned Reservoir Content Report, April 1, 2004). Storage contents are markedly less at projects in the Musselshell and Judith River basins. Martinsdale and Deadman's Basin reservoirs are well below normal at 44 and 41 percent of average. The prospects for additional storage are

uncertain at this time, as the mountain snowpack melts off and drought-stressed soils and forest fuels in uplands soak up moisture before if can runoff to local tributaries.

Ackley, Bair, and East Fork of Rock Creek reservoirs are below average, but will benefit when seasonal weather brings out snowpack remaining in the mountains. As the deficit of soil moisture is replenished and runoff from high elevations increases, storage at a number of state projects will improve. However, without continued average to above average precipitation, shortages can be expected at some state reservoirs by mid- to late summer.

Streamflow

The U.S. Geological Survey (USGS) operates and monitors numerous stream-gauging stations across the State of Montana. USGS reported that during April 2004, two of eight long-term stream-gauging stations had monthly mean streamflow above the normal range, three had normal flow, and three stations recorded flow below the normal range. According to USGS, "normal" ranges from 80 to 120 percent. (See Table 2. April 2004 Streamflow in Montana)

Streamflow was below the normal range during April on the Marias River near Shelby, Rock Creek below Horse Creek near the International Boundary, and the Yellowstone River at Billings. The mean April monthly streamflow was within the normal range on the Yaak River near Troy, Blackfoot River near Bonner, and the Clark Fork River at St. Regis. Streamflow on Middle Fork of the Flathead River near West Glacier was above the mean April flow at 121 percent of average, and on the Yellowstone River at Corwin Springs. It should be noted that some runoff of mountain snowpack occurred earlier than usual in a number of river basins, statewide, due to unusually warm temperatures recorded during March and April.

According to the NRCS April 1, 2004 Montana Water Supply Outlook Report, streamflows statewide are forecasted to range from 64 to 77 percent of average for the period of April through July. According to the NRCS, "Actual streamflows will now depend upon how the remaining snowpack melts and the timing and amount of rainfall received." As was true at this time last year, May and June rain will be critical to maintain streamflows during from late spring through summer.

Streamflow west of the Continental Divide is forecasted to range between 62 and 72 percent of average. Streamflow of the upper Clark Fork River is expected to range from 51 to 65 percent. The lower Clark Fork should range between 64 and 71 percent, the Bitterroot River is expected to range from 64 to 73 percent, the Flathead River from 65 to 73 percent, and the Kootenai River from 73 to 81 percent of the 30-year average.

East of the Continental Divide, streamflow for the Missouri River is forecasted to range from 62 to 79 percent of average. The lower Yellowstone River is expected to range from 56 to 70 percent of average, and the upper Yellowstone between 75 and 85 percent for the same period. It is very important to note that the foregoing streamflow forecasts assume average precipitation to occur over the period of forecast. Water supply managers should be conservative in projecting streamflow and are advised by NRCS to consider referencing the 70 percent exceedance figure in making risk assessments (the flow that would be exceeded in seven of ten years).

Surface Water Supply Index

The NRCS generates the Surface Water Supply Index (SWSI) as an index of surface water availability for 51 Montana river basins based on mountain snowpack, mountain and valley precipitation, streamflow, soil moisture, and reservoir storage. The SWSI is used to forecast surface water supply, and is best applied to mountainous areas with surface water supplies that are primarily dependent on spring runoff of mountain snowpack See (Map Figure 1. SWSI Values as of May 1, 2004).

As of May 1, 2004, 30 of 51 of the state's river basins were ranked as Extremely dry (-3.0 to -4.0). Seven river basins of the 30 Extremely Dry basins were at –4.0, or the most severe ranking the SWSI scale allows. This may be unprecedented in the history of the index. The Missouri River below Fort Peck SWSI at -4.0, the Jefferson River, Big Hole River, Beaverhead River, the Ruby River, The Swan River, and the Little Bitteroot, all have SWSIs of – 4.0. As of April 1, 2004, only 7 river basins were in the Extremely Dry category. This fast rate of deterioration is, for the most part, due to unseasonably warm temperatures in the high elevations and the depth of the hydrological drought.

U.S. Drought Monitor

The Drought Monitor map is a widely used weekly assessment product that describes the degree and extent of drought conditions across the nation. See:(http://drought.unl.edu/dm)

The Drought Monitor ranks the degree of drought from Abnormally Dry (D-0) to Moderate (D-1), Severe (D-2), Extreme (D-3), and Exceptional (D-4). Montana water supply and moisture experts are consulted weekly in the national discussion regarding the data and information considered in the demarcation of areas and degree of drought impacts.

The May 4, 2004 Drought Monitor map indicates that about one-half of the area of the state is within the Extreme, or D3 Drought category, and runs from the entire length of the state along its south borders, north to from midway on its east border with the Dakotas to the province of Alberta in the northcentral region, and to the area along the Continental Divide, from Yellowstone Park in the south to the eastern edge Glacier National Park in the north. The remainder of the state, on both sides of the Continental Divide, is designated as D1 Drought – Moderate or D2 Drought – Severe.

The only exceptions are a four-county northeast corner of the state in the D0 - Abnormally Dry to no drought, and D4 Exceptional, or record-breaking level drought, in the southwest area of the state, straddling the Continental Divide, including much of Beaverhead County, most of Madison County, and northward, through portions of Jefferson, Deer Lodge, Lewis and Clark, Powell, Cascade, and Teton counties. Apart from an area of D4 Exceptional Drought that extends southward from Beaverhead County into the Snake River basin of Idaho, Montana has the only and largest area of D4 drought in the 50 United States at this time. The May 4, 2004 U.S. Drought Monitor map assessment of degree and extent of drought is, for the most part, consistent with the April 23, 2004 Montana Drought Advisory Committee's Status Map, by County. See: http://nris.state.mt.us/Drought/status/DroughtStatusMaps.html

The Montana Drought Status Map is prepared monthly by the Montana Governor's Drought Advisory Committee and posted on its Montana Drought Monitoring Internet site at: http://nris.state.mt.us/drought

Weather and Climate Forecasts

According to the National Climate Prediction Center (CPC) the 30-day outlook for through May calls for normal temperatures and precipitation statewide with the exception of slightly below temperatures (43% probability - 10% added to 33.3%) east of the Continental Divide in northeast Montana, and for about a 40% chance of slightly below precipitation for the southern tier of the state east of the divide.

The 2.5-month long-lead outlook for July through early September, calls for temperatures and precipitation to be within the normal range statewide, with the exception of warmer than average temperatures in the southwest corner of Montana and slightly drier for precipitation outlook along the western edge of the state.

Wildfire Potential

The Northern Rockies Coordination Center, located at the Missoula Regional Airport issues an early season fire assessment that can b found at: http://www.fs.fed.us/r1/fire/nrcg/

Assessment are also available on the NRCC Web Page: http://www.fs.fed.us/r1/fire/nrcc/

As of April 1, 2004, 1000-hour fuels for Montana east of the Divide were rated low, at between 11 and 14 percent. The 1000-hour fuels, which include the large live trees, should be at between 17 and 22 percent, at the end of spring, or approaching normal. Above average precipitation since the April 1, 2004 report is expected to have improved the 1000-hour live moisture levels.
See: http://www.fs.fed.us/land/wfas/fm_1000.gif

As of April 23, 2004 the Northern Rockies Fire Coordination Center predicts the wildfire severity potential for May to be "Above Normal" for southeastern Montana and "Above Normal" for the season, statewide. Should low precipitation and high temperatures dominate in coming weeks, range and grass fire potential could rise quickly. Greenup is continuing at most valley elevations. The energy release component is currently higher for forests across Montana on both sides of the Continental Divide than it was at this time in 2001. The report notes that much of Montana east of the Divide remains in moderate to extreme drought.

RESPONSES TO WATER SUPPLY AND MOISTURE CONDITIONS

As the Montana Governor's Drought Advisory Committee continues to assess the rate and degree of recovery from the current protracted cycle of drought, it is instructive to consider the different types of drought, as assessments vary depending upon type and duration of drought. In this regard, the National Drought Mitigation Center, located at the University of Nebraska, Lincoln, has prepared the following narrative:

What is Drought?

(National Drought Mitigation Center: http://www.drought.unl.edu/whatis/concept.htm)

Understanding and Defining Drought

The Concept of Drought

Drought is a normal, recurrent feature of climate, although many erroneously consider it a rare and random event. It occurs in virtually all climatic zones, but its characteristics vary significantly from one region to another. Drought is a temporary aberration; it differs from aridity, which is restricted to low rainfall regions and is a permanent feature of climate.

Drought is an insidious hazard of nature. Although it has scores of definitions, it originates from a deficiency of precipitation over an extended period of time, usually a season or more. This deficiency results in a water shortage for some activity, group, or environmental sector. Drought should be considered relative to some long-term average condition of balance between precipitation and evapotranspiration (i.e., evaporation + transpiration) in a particular area, a condition often perceived as "normal". It is also related to the timing (i.e., principal season of occurrence, delays in the start of the rainy season, occurrence of rains in relation to principal crop growth stages) and the effectiveness (i.e., rainfall intensity, number of rainfall events) of the rains. Other climatic factors such as high temperature, high wind, and low relative humidity are often associated with it in many regions of the world and can significantly aggravate its severity.

Drought should not be viewed as merely a physical phenomenon or natural event. Its impacts on society result from the interplay between a natural event (less precipitation than expected resulting from natural climatic variability) and the demand people place on water supply. Human beings often exacerbate the impact of drought. Recent droughts in both developing and developed countries and the resulting economic and environmental impacts and personal hardships have underscored the vulnerability of all societies to this "natural" hazard.

There are two main kinds of drought definitions: conceptual and operational.

Conceptual Definitions of Drought

Conceptual definitions, formulated in general terms, help people understand the concept of drought. For example: Drought is a protracted period of deficient precipitation resulting in extensive damage to crops, resulting in loss of yield.
Conceptual definitions may also be important in establishing drought policy. For example, Australian drought policy incorporates an understanding of normal climate variability into its definition of drought. The country provides financial assistance to farmers only under "exceptional drought circumstances," when drought conditions are beyond those that could be considered part of normal risk management. Declarations of exceptional drought are based on science-driven assessments. Previously, when drought was less well defined from a policy standpoint and less well understood by farmers, some farmers in the semiarid Australian climate claimed drought assistance every few years.

Operational Definitions of Drought

Operational definitions help people identify the beginning, end, and degree of severity of a drought. (An abbreviated description of operational definitions is also available.) To determine the beginning of drought, operational definitions specify the degree of departure from the average of precipitation or some other climatic variable over some time period. This is usually done by comparing the current situation to the historical average, often based on a 30-year period of record. The threshold identified as the beginning of a drought (e.g., 75% of average precipitation over a specified time period) is usually established somewhat arbitrarily, rather than on the basis of its precise relationship to specific impacts.

An operational definition for agriculture might compare daily precipitation values to evapotranspiration rates to determine the rate of soil moisture depletion, then express these relationships in terms of drought effects on plant behavior (i.e., growth and yield) at various stages of crop development. A definition such as this one could be used in an operational assessment of drought severity and impacts by tracking meteorological variables, soil moisture, and crop conditions during the growing season, continually reevaluating the potential impact of these conditions on final yield. Operational definitions can also be used to analyze drought frequency, severity, and duration for a given historical period. Such definitions, however, require weather data on hourly, daily, monthly, or other time scales and, possibly, impact data (e.g., crop yield), depending on the nature of the definition being applied. Developing climatology of drought for a region provides a greater understanding of its characteristics and the probability of recurrence at various levels of severity. Information of this type is extremely beneficial in the development of response and mitigation strategies and preparedness plans.

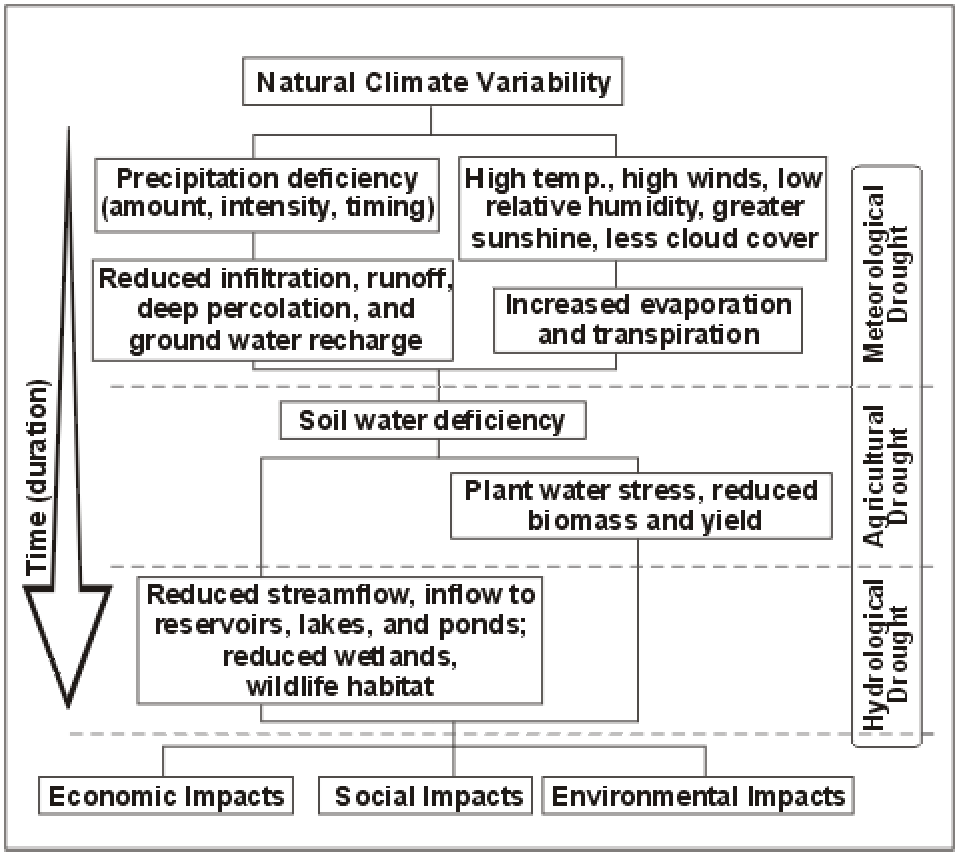
Disciplinary Perspectives on Drought:
Meteorological, Hydrological, Agricultural and Socioeconomic

Meteorological Drought
Meteorological drought is defined usually on the basis of the degree of dryness (in comparison to some "normal" or average amount) and the duration of the dry period. Definitions of meteorological drought must be considered as region specific since the atmospheric conditions that

result in deficiencies of precipitation are highly variable from region to region. For example, some definitions of meteorological drought identify periods of drought on the basis of the number of days with precipitation less than some specified threshold. This measure is only appropriate for regions characterized by a year-round precipitation regime such as a tropical rainforest, humid subtropical climate, or humid mid-latitude climate. Other definitions may relate actual precipitation departures to average amounts on monthly, seasonal, or annual time scales.

Agricultural Drought
Agricultural drought links various characteristics of meteorological (or hydrological) drought to agricultural impacts, focusing on precipitation shortages, differences between actual and potential evapotranspiration, soil water deficits, reduced ground water or reservoir levels, and so forth. Plant water demand depends on prevailing weather conditions, biological characteristics of the specific plant, its stage of growth, and the physical and biological properties of the soil. A good definition of agricultural drought should be able to account for the variable susceptibility of crops during different stages of crop development, from emergence to maturity. Deficient topsoil moisture at planting may hinder germination, leading to low plant populations per hectare and a reduction of final yield. However, if topsoil moisture is sufficient for early growth requirements, deficiencies in subsoil moisture at this early stage may not affect final yield if subsoil moisture is replenished as the growing season progresses or if rainfall meets plant water needs.

Hydrological Drought
Hydrological drought is associated with the effects of periods of precipitation (including snowfall) shortfalls on surface or subsurface water supply (i.e., streamflow, reservoir and lake levels, ground water). The frequency and severity of hydrological drought is often defined on a watershed or river basin scale. Although all droughts originate with a deficiency of precipitation, hydrologists are more concerned with how this deficiency plays out through the hydrologic system. Hydrological droughts are usually out of phase with or lag the occurrence of meteorological and agricultural droughts. It takes longer for precipitation deficiencies to show up in components of the hydrological system such as soil moisture, streamflow, and ground water and reservoir levels. As a result, these impacts are out of phase with impacts in other economic sectors. For example, a precipitation deficiency may result in a rapid depletion of soil moisture that is almost immediately discernible to agriculturalists, but the impact of this deficiency on reservoir levels may not affect hydroelectric power production or recreational uses for many months. Also, water in hydrologic storage systems (e.g., reservoirs, rivers) is often used for multiple and competing purposes (e.g., flood control, irrigation, recreation, navigation, hydropower, wildlife habitat), further complicating the sequence and quantification of impacts. Competition for water in these storage systems escalates during drought and conflicts between water users increase significantly.



The Montana Drought Plan

The Montana Drought Plan contains a conceptual definition of drought on page 5 of this report. Operational definitions have corresponding actions to be taken by state and local government, triggered by conditions as characterized by drought status, and are included in the Montana Drought Plan.

The Drought Advisory Committee introduced a new system of classification of the degree of drought in early 2004 that includes six categories ranging from least to most severe: No Drought – Moist; No Drought; Slightly Dry; Moderately Dry; Severely Dry; and Extremely Dry.
See: http://nris.state.mt.us/drought/Status/droughtstatusmaps.html

At this time 29 counties are classified as within the Severely Dry category, 12 counties are in the Moderately Dry category, 10 are in the Slightly Dry category, and four counties are in the No Drought category. One county, Beaverhead County, is in the Extremely Dry category and there are no counties in the No Drought – Moist category at this time (See Drought Status map figure).

Counties classified as within the "No Drought" category at this time include four counties in the northeast corner of the state, Richland, Roosevelt, Daniels, and Sheridan. Counties in the Slightly Dry category include seven counties east of the Continental Divide, four of which are located in the

Northeast climate division, two in the north section of the Southeast climate division, and one at the eastern edge of the Northcentral climate division. West of the divide, Slightly Dry counties include Ravalli, Granite, and Deer Lodge counties, all located at the southern edge of the Western climate division.

The recommendations regarding drought status by county were developed by the drought committee's technical advisory subcommittee, which includes representatives from DNRC, NRCS, the National Weather Service, a Congressional Office, Montana Groundwater Information System at Montana Tech, and the Montana Agricultural Statistics Service. The group considers a wide variety of data in its determination of drought status for the state's counties.

Dissemination of Information

The Montana Drought Plan emphasizes the importance of dissemination of water supply and moisture conditions through the news media, especially in the early season time frame and during periods of above average moisture, when people are inclined to believe a drought is ending.

Drought Monitoring Internet Site

The Montana State Library's Natural Resources Information System provides support to the drought committee in managing the committee's Drought Monitoring Internet site. The site contains reported and real-time moisture and water supply data, information on sources of assistance, an archive of news articles, a schedule of the committee's future meeting dates, information from local drought committees and watershed groups, and water conservation information links. See: http://nris.state.mt.us/drought/ for the state's Drought Monitoring Internet site. The site had nearly 20,000 visits recorded in 2002. The “hit” counter for the site was not operating in 2003.

For 2004, the committee is scheduled to meet February 20, March 19, April 23, May 20, June 17, July 15, August 19, September 16, and October 21 and will continue to monitor changes in conditions and issue changes in the drought status of the state's counties in accordance with the state's drought plan.

Support For Watershed Groups and Local Drought Committees

The Drought Advisory Committee member agencies continue to provide support to watershed groups and local drought committees. FWP Water Resources and DNRC Water Resources personnel continue to provide planning, facilitation, and technical support to a number of watershed groups. Local meeting minutes are posted regularly on the Drought Monitoring web site at: http://nris.state.mt.us/drought/LocalCommittees.html

DNRC and the Bureau of Reclamation have notified stored water users located in river basins in which they manage water storage projects, of water supply prospects for the irrigation season. A few federal and state-owned projects are projected to have abbreviated irrigation seasons for local water users. Projects located in the Musselshell, Smith, and Sun River basins have projected water

storage that may not meet demand over the course of the summer without receiving average to above average precipitation on an ongoing basis.

Technical Assistance

Drought Advisory Committee member agencies DNRC and FWP actively provide technical support personnel to assist watershed groups with water measurement, water supply management, and fishery assessment needs. Agencies have also directed regional office personnel to attend watershed group and local drought meetings to answer questions regarding water rights and sources of financial and technical assistance.

Local groups have been requested to provide the Governor's Drought Advisory Committee with regular reports on local drought conditions and any need for technical support. Reports from local committees and watershed groups will be posted on the Drought Monitoring Internet site with their permission. For drought planning technical assistance call (406) 444-6628.

Financial Assistance

In the wake of four years of drought, added emphasis has been placed on early season preparation for the mitigation of drought impacts to municipal water supplies, irrigation water supplies, stream fisheries, and agriculture. The following listing of state and federal assistance programs is not all-inclusive. While some USDA assistance programs are open for applications continuously, others require approval by the Farm Service Agency based upon guidelines and criteria that must be met before the agricultural producers in a county become eligible to apply.

Likewise, a number of grants and loans to fund drought mitigation projects are available on a regular basis through state government. The Drought Monitoring Internet web site has a section dedicated to assistance programs labeled Resources and Assistance. Call (406) 444-6628 for more information. See: http://nris.state.mt.us/drought/assistance.html

State Agency Response and Preparation

U.S. Bureau of Reclamation
Reclamation States Drought Relief Assistance Act of 1991
Public Law 102-250

The Bureau of Reclamation is authorized to provide funding assistance under the Reclamation States Drought Relief Act of 1991 to mitigate effects of drought upon wetlands, rivers and streams, reservoirs, and municipal water supplies. For 2004 proposals, the program became active October 1, 2003. Eligible projects include construction projects that manage limited supplies of water and instream flow lease proposals that result in a significant amount of water left instream that can be monitored. Reclamation has notified the state that $400,000 in funding is available for projects in Montana for 2004. This is not a typical grant program. Reclamation contracts with the entities for the work to be performed and provides project oversight and monitoring.

The law requires that only "temporary" construction projects be funded, except for municipal well development. Reclamation cannot fund projects such as the construction of a permanent small dam, or a new canal. Reclamation can arrange for sealing leaky canals or ditches with synthetic or biodegradable material typically applied by spraying, purchase water from a willing seller to augment instream flow, or "construct" a temporary diversion canal which would have to be removed after the drought is over. Reclamation can drill new municipal wells but cannot fund construction of a water distribution system.

Any entity, including Tribes or state agencies can submit a request for funding. Applicants should submit a short description of the proposed project, a cost associated with the project, any cost sharing, and a project justification, including benefits provided and/or impacts mitigated. This proposal should be limited to one page in length. As of April 22, 2004 over $105,000 has been approved for Montana applicants, primarily for the sealing of irrigation canals at eleven locations across the state. Projects requesting about $200,000 in additional funding are currently pending. Requests and questions can be directed to Mr. Jess Aber at Montana Department of Natural Resources and Conservation at (406) 444-6628.

USDA *Farm Service Agency*

The committee has dedicated considerable time over the past four years in working with the USDA Farm Service Agency (FSA) to secure access for impacted Montana farmers and ranchers to assistance programs to address impacts of drought. For three consecutive years, the Governor has made special requests, on behalf of Montana agricultural producers, for early or carryover Natural Disaster Designations (NDD) for drought from the Secretary of Agriculture.

This year, the state is resuming the normal procedure regarding the NDD, of waiting to see how agriculture fares in coming weeks before considering making a request for one. The NDD does not have a bearing on programs such as the Conservation Reserve Program (CRP) or the Emergency Conservation Program (ECP). The NDD activates a low-interest loan program for drought-impacted agricultural producers and for small business affected by drought, and certain tax breaks or deferrals for producers that can demonstrate impacts caused by drought.

The Drought Advisory Committee will remain vigilant on behalf of Montana agricultural producers regarding the rate of recovery from drought and the needs of producers to remain operational in the face of a potential return to severe drought conditions. The committee will not hesitate to make requests in a timely fashion to USDA for disaster assistance for affected producers and is currently reviewing all options to secure federal assistance for drought-affected producers.

The Natural Disaster Designation (NDD) status received for Montana last year for 35 counties for 2003 remains in place through the end of July 2004, for claims on losses in 2003. And Governor Martz recently received notification from Secretary of Agriculture Veneman that eleven additional counties and three tribal nations were upgraded from contiguous status to primary status for the 2003 NDD, making them eligible for additional benefits reserved for primary counties. The USDA state office of FSA has also approved some Montana counties for ECP and CRP Haying and Grazing for 2004 in recent weeks. County USDA Committees

can now petition the State USDA Committee for eligibility to the foregoing programs without approval from Washington, D.C.

The Farm Service Agency has announced that the U.S. Drought Monitor map product would be used as a guide by the FSA in 2004 in determining the eligibility of agricultural producers in Montana for disaster assistance, by county, should the programs be activated. The U.S. Drought Monitor is a cooperative map product prepared weekly by a team of preparers from the USDA, the National Drought Mitigation Center, and the National Oceanic and Atmospheric Administration.

The Drought Committee represents Montana in the preparation of the weekly Drought Monitor map to ensure that conditions across the state are portrayed accurately. Previously, FSA employed an analysis of amount of precipitation received over the course of preceding months, which was a source of frustration for many producers, mainly due to its lack of comprehensive data and failure to consider the effects of temperature and wind upon moisture received.

Montana Fish, Wildlife, and Parks
Future Fisheries Program

Montana FWP provided a special grant review period for Spring 2004 for its Future Fisheries Program to consider proposals that would provide an increase or preservation of instream flow on key streams or rivers during periods of low flow associated with drought conditions. Other application cycles occur in July and in December. Any individual or group with a project designed to restore or enhance instream flow may apply. The program funding can be used to drill stock water wells to replace diversion of streamflow for stock water, thereby leaving additional streamflow instream.

Projects should result in significant benefits to stream fisheries on a long-term basis and the subject water must remain instream for a significant distance of the stream. Leased water will be monitored to ensure that the water is protected instream and not diverted by another user. Contact Mr. Glenn Phillips at (406) 444-5334, or Mr. Mark Lere at (406) 444-2432 at Fish, Wildlife, and Parks for more information.

Recommendations for Drought Preparation and Response

The impacts of drought can be minimized at different scales by identifying measures that can be taken individually and collectively, recording them in a plan, ensuring implementation, and monitoring effectiveness by measuring savings in water. For more information on water conservation go to Montana Drought Monitoring at nris.state.mt.us/drought - What You Can Do - Helpful Information - Conservation Information:
See: http://nris.state.mt.us/drought/whatyoucando.html

Monitoring and Reporting

Each month, drought monitoring data and SWSI water supply maps are posted on the Montana Drought Monitoring Internet site which is located on the State Library's Natural Resource Information System (NRIS) at: http://nris.state.mt.us/drought. Links are provided to real-time data

on mountain snowpack, reservoir storage, and streamflow, as well as to a wealth of other water supply information. The drought committee staff can be contacted at (406) 444-6628.

See the Internet site for more information on meeting locations and times. The committee will continue to monitor and report conditions over the coming months, assessing the drought. When warranted, the committee will take action consistent with the Montana Drought Response Plan.

The Montana Department of Agriculture Internet address: http://agr.state.mt.us/
Montana Agricultural Statistics Service Internet address: http://www.nass.usda.gov/
Montana DNRC Internet address: http://www.dnrc.state.mt.us/

MAP FIGURES

Montana Drought Status by County
April 23, 2004

http://nris.state.mt.us/Drought/status/DroughtStatusMaps.html

Montana Surface Water Supply Index
May 1, 2004

http://nris.state.mt.us/wis/SWSInteractive/

Montana Precipitation - Water Year
October 1, 2003 through April 30, 2004

http://www.wrh.noaa.gov/greatfalls/text/wateryear_percent.html

Montana Precipitation – April 2004

http://www.wrh.noaa.gov/Greatfalls/tfx.php?IMAGE+hydro/images/aprpcntnorm.png

Montana Precipitation 5-year Departure From Average January 1999 – March 2004

http://www.wrh.noaa.gov/Greatfalls/hydro/images/mt_1999.pdf

U.S. Drought Monitor Map

http://www.drought.unl.edu/dm/monitor.html

TABLES

TABLE 1

Remaining Snowpack in Montana and
Year-to-Date Precipitation[1]

Based on Mountain Data from NRCS SNOTEL Sites
As of Monday, April 19, 2004

Basin	Remaining Snow Water Equivalents[2] (% of average)[3]	Year-to-Date[4] Precipitation (% of average)
Kootenai River	71	87
Flathead River	69	86
Upper Clark Fork River	76	83
Bitterroot River	65	83
Lower Clark Fork River	66	82
Jefferson River	70	81
Madison River	80	86
Gallatin River	68	79
Missouri River Headwaters	72	82
Headwaters Missouri Mainstem	75	86
Smith, Judith, & Musselshell Rivers	65	89
Sun, Teton, & Marias Rivers	67	84
Missouri Mainstem River Basin	67	87
St. Mary & Milk Rivers	63	84
Upper Yellowstone	59	78
Bighorn River (Wyoming)	63	80
Tongue River (Wyoming)	67	89
Powder River (Wyoming)	62	79
Lower Yellowstone	67	81

Notes

(1) Information taken from Natural Resource Conservation Service Snow-Precipitation Update.
(2) A "snow water equivalent" is the depth of snow equivalent to one inch of water.
(3) Reference period for average conditions is 1971-2000.
(4) October 1, 2003 to present

TABLE 2

April 2004 Streamflow in Montana [1]

Station Name	Monthly [2] Mean Flow(cfs)	1971-2000 Average Monthly Flow (cfs)	% of Average Flow
Yaak River near Troy	1,720	1,960	88
Blackfoot River near Bonner	2,470	2,140	115
Clark Fork at St. Regis	9,110	9,000	101
Middle Fork of Flathead near West Glacier	5,280	3,300	160
Marias River near Shelby	632	1,000	63
Rock Creek below Horse Creek, near International Boundary	52.7	75.4	70
Yellowstone River at Corwin Springs	2,090	1,730	121
Yellowstone River at Billings	3,190	4,440	72

Notes

(1) Information is provided by the U.S. Geological Survey (USGS). According to the USGS, the eight gaging sites in Table 2 are representative of April 2004 streamflow conditions throughout Montana.

(2) Data is provisional and subject to revision.

TABLE 3

U.S. Bureau of Reclamation Reservoirs[1]

Reservoir	Drainage	April 1, 2004			Year Ago (4/01/03)	
		Contents (ac-ft)	% of Avg. [2]	% of Capacity	Contents (ac-ft)	% of Avg
Clark Canyon[4]	Beaverhead	55,200	37	32	71,400	45
Canyon Ferry	Missouri	1,376,100	95	73	1,669,400	114
Gibson	Sun	34,600	72	36	82,000	153
Lake Elwell	Marias	742,000	105	77	833,900	113
Sherburne	St. Mary & Milk	21,800	88	32	19,200	91
Fresno [3]	Milk	29,400	56	32	87,400	124
Nelson	Milk	55,100	101	70	74,900	124
Bighorn Lake[4]	Bighorn	699,300	84	65	624,000	76
Hungry Horse	South Fork Flathead	2,456,000	130	71	2,668,000	112

Notes

(1) Information provided by U.S. Bureau of Reclamation (USBR).
(2) Percent of 1971-2000 average storage.
(3) Fresno average storage revised according to results of 1999 sediment study.
(4) Lowest end-of- April storage of record.

TABLE 4

State-Owned Reservoirs [1]
April 1, 2004

Reservoir	Drainage	April 1,2004			Year Ago (5/01/03)	
		Contents (ac-ft) [2]	% of Avg.	% of Capacity [3]	Storage (ac-ft)	% of Avg.
Missouri River Basin						
Ackley Lake	Judith River	1,440	43	25	3,230	83
Bair	Musselshell	2,660	59	38	3,840	69
Deadman's Basin	Musselshell	20,690	41	29	24,040	43
Martinsdale	Musselshell	4,160	44	18	5,880	47
Middle Creek (Hyalite)[4]	Gallatin	6,510	102	64	7,500	112
Nilan	Sun River	5,510	79	55	8,900	125
North Fork of Smith	Smith River	5,810	82	51	8,550	98
Ruby River	Ruby River	27,790	89	76	37,620	105
Yellowstone River Basin						
Cooney [4]	Rock Creek	21,280	101	76	25,740	114
Tongue River [4]	Tongue River	49,420	130	63	55,760	127
Clark Fork Basin						
East Fork Rock Creek	Rock Creek	6,540	70	41	7,120	76
Nevada Creek	Blackfoot	7,420	96	67	10,580	105
Painted Rocks	Bitterroot	11,400	97	36	30,740	169

Notes

Information from Montana Department of Natural Resources and Conservation, State Water Projects Bureau

(1) Ac-ft is an abbreviation for acre-feet, a measure of volume. An acre-foot covers one acre of land one foot deep.

(2) 100 percent capacity indicates reservoir is full.

(3) Capacity and average storage values reflect post-rehabilitation data.

TABLE 5				
Palmer Drought Severity Indices (PDSI) in Montana [1]				
District	PDSI 4/17/04	PDSI 4/05/03	Cumulative Precip. Deficit (inches)	
			4/17/04	4/05/03
Northwest	-3.33	+1.46	3.69	0.00
Southwest	-6.97	-4.03	7.41	4.12
Northcentral	-3.05	-0.35	2.65	0.00
Central	-5.18	-1.93	5.27	1.51
Southcentral	-5.29	-1.89	6.55	1.55
Northeast	-0.51	+0.06	0.09	0.00
Southeast	-3.41	-1.19	3.22	0.57

Explanation: The Palmer Drought Severity Index describes the intensity of prolonged wet or dry periods as shown below.

Range	Description
+4.0 and greater	Extremely moist spell
+3.0 through +3.99	Very moist spell
+2.0 through +2.99	Unusually moist spell
+1.0 through +1.99	Moist spell
+0.5 through +0.99	Incipient moist spell
-0.49 through +0.49	Normal
-0.5 through -0.99	Incipient Drought
-1.0 through -1.99	Mild drought
-2.0 through -2.99	Moderate drought
-3.0 through -3.99	Severe drought
-4.0 and less	Extreme drought

Notes

(1) Palmer Drought Severity Indices provided by Climate Analysis Center, Wash. D.C

TABLE 6

Montana Surface Water Supply Indices (SWSI)
May 1, 2004

Basin	SWSI	Basin	SWSI
Tobacco River	-2.1	Missouri River ab. Cnyon Ferry	-3.3
Kootenai Riv. bel Libby Dam	-0.2	Missouri R. bel. Canyon Ferry	-3.6
Fisher River	-3.0	Smith River	-3.1
Yaak River	-3.0	Sun River	-3.1
North Fork Flathead River	-2.4	Teton River	-2.8
Middle Fork Flathead River	-2.7	Birch/Dupuyer Creeks	-3.1
South Fork Flathead River	+1.8	Marias River above Tiber	-2.8
Flathead R. at Columbia Falls	-1.9	Marias River below Tiber	-2.2
Stillwater/Whitefish Rivers	-3.3	Musselshell River	-3.4
Swan River	-4.0	Missouri above Fort Peck Res.	-2.5
Flathead River at Polson	-2.4	Missouri River below Fort Peck	-4.0
Mission Valley	-3.5	Milk River	-3.2
Little Bitterroot River	-4.0	Dearborn River near Craig	-3.3
Clark Fork above Milltown	-2.5	Yellowstone R. ab. Livingston	-2.9
Blackfoot River	-2.4	Shields River	-3.2
Bitterroot River	-3.3	Boulder River (Yellowstone)	-3.5
Clark Fork bel. Bitterroot R.	-3.1	Stillwater River	-3.3
Clark Fork below Flathead R.	-2.6	Rock/Red Lodge Creeks-	-3.4
Beaverhead River	-4.0	Clarks Fork Yellowstone River	-2.5
Ruby River	-4.0	Yellowstone above Bighorn R.	-3.0
Big Hole River	-4.0	Bighorn River	-3.3
Boulder River (Jefferson)	-3.0	Little Bighorn River	-2.9
Jefferson River	-4.0	Yellowstone bel. Bighorn River	-3.1
Madison River	-2.2	Tongue River	-3.2
Gallatin River	-2.6	Powder River	-2.9

Note: The Surface Water Supply Index (SWSI) is an indicator describing predicted surface water availability. The May 1, 2004 SWSI describes spring surface water supply conditions near the start of the 2004 growing season. The map at the end of this report further illustrates May 1, 2004 SWSI values.